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Hospitalization and mortality in Mexico due to breast cancer since its inclusion in the catastrophic expenditures scheme

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Hospitalización y mortalidad en México
por cáncer de mama a partir de su inclusión
en el esquema de gastos catastróficos.
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Abstract

Objective. To compare trends in hospital discharges and mortality due to breast cancer (BC) in Mexico from 2004 to 2012 by insurance condition before and after incorporating BC comprehensive treatment into the System of Social Protection in Health (*Sistema de Protección Social en Salud*, SPSS) in 2007. **Materials and methods.** Data on BC hospital discharges and mortality reported in women aged 25 years and over were obtained from the National Health Information System. Mortality rates were adjusted by age and state. **Results.** At the national level, a growing tendency in hospital discharges was observed, mainly for women without social security, while mortality rate remained constant. Mortality rates by state show that lower marginalization index corresponded to higher mortality. **Conclusions.** A differential behavior was observed among women according to insurance condition, partly due to the inclusion of BC treatment in the SPSS.

Keywords: breast cancer; mortality rate; hospitalization; Mexico

Resumen

Objetivo. Comparar las tendencias de egresos hospitalarios y mortalidad por cáncer de mama (CaMa) en México de 2004 a 2012, según esquema de aseguramiento, antes y después de la incorporación del tratamiento integral del CaMa al Sistema de Protección Social en Salud (SPSS) en 2007. **Material y métodos.** Los egresos hospitalarios y de mortalidad por CaMa en mujeres de 25 años o más se obtuvieron del Sistema Nacional de Información en Salud. Las tasas de mortalidad se ajustaron por edad y entidad federativa. **Resultados.** A nivel nacional, hubo una tendencia creciente de los egresos hospitalarios, principalmente para mujeres sin seguridad social, mientras que la tasa de mortalidad se mantuvo constante. Las tasas de mortalidad fueron mayores en estados con menor índice de marginación. **Conclusiones.** Se observó un comportamiento diferencial entre las mujeres según esquema de aseguramiento en salud debido, en parte, a la inclusión del tratamiento de CaMa al SPSS.

Palabras clave: cáncer de mama; tasa de mortalidad; hospitalización; México

Worldwide, breast cancer (BC) is the most common cancer among women. In 2012, more than 1.67 million new cases were diagnosed, representing one in four cancers among women (25.2%) and 12% of all cancers.¹ Breast cancer is the fifth leading cause of cancer

death worldwide. This disease causes approximately 522 000 deaths per year, and in the case of women, it represents the most common cause of cancer death.¹ In Latin America and the Caribbean, 27% of new cancer cases and 15% of cancer deaths are due to BC.^{1,2}

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Although Mexico is one of the 10 countries with the lowest incidence and mortality rates in the Americas,^{1,2} standardized mortality rates per 100 000 women aged 25 years and older in 2009 ranged between 9.10 and 26.69 in the individual states.³ A trend of increasing standardized mortality rates, which rose from 11.7 to 17.0 deaths per 100 000 women aged 25 years and over between 1980 and 2009, was observed.³

There are no figures available on the incidence of BC because Mexico does not have a histopathological cancer registry. However, less than 10% of BC cases are estimated to be detected in a timely manner.^{4,5} and 50-80% of those cases are found in advanced stages.^{5,6} In Mexico^{5,7,8} and other countries,⁹⁻¹² low screening coverage¹³ and diagnostic delay cause lower survival, lower quality of life, less efficient use of resources and, above all, increased mortality.

A policy that reformed the Mexican health system was established in 2003.¹⁴ The System of Social Protection in Health (*Sistema de Protección Social en Salud*, SPSS) was established. SPSS provisions entered into force in 2004. The main financial component of SPSS is voluntary public insurance, known as Popular Insurance (*Seguro Popular*).¹⁵ Another component of the SPSS is the Fund for Protection against Catastrophic Expenditures (*Fondo de Protección contra Gastos Catastróficos*, FPGC), which aims to support the Mexican population that lacks any health insurance scheme in the care of high-cost diseases and those that cause catastrophic expenditures.¹⁴⁻¹⁶ In 2007, a comprehensive BC treatment was included in the FPGC and thereby guaranteed that Mexican women with BC have access to comprehensive and free medical care in units certified by the SPSS.¹⁴

A greater increase in the number of hospital discharges in hospitals affiliated with the SPSS than in the social security hospitals could be expected due to the decrease of financial barriers through the incorporation of BC into the FPGC; consequently, a decrease in BC mortality rates should be expected.¹⁷ In this context, the aim of this study was to examine the trends in hospital discharges and mortality by BC in Mexico from 2004 to 2012 according to insurance scheme to identify the medium-term changes that have been caused by the inclusion of the comprehensive BC treatment into the FPCE of the SPSS since 2007.

Materials and methods

Design

An ecological study was conducted to compare trends in hospital discharges and mortality from BC in Mexico

from 2004 to 2012 among women aged 25 years and older, according to insurance scheme before and after the inclusion of the comprehensive BC treatment into the FPGC of the SPSS in 2007. This period was chosen because the SPSS entered into force in 2004 and based on the availability of hospital databases at the time the analysis was performed.

Information sources

Data on hospital discharge and mortality in the period 2004-2012 were disaggregated by age, federal state and insurance scheme. Databases in dynamic cube format, which are available on the website of the General Directorate of Health Information (*Dirección General de Información en Salud*, DGIS) of the National Health Information System, constituted the data source.¹⁸ The International Statistical Classification of Diseases and Related Health Problems (CIE-10) code C50 was used to identify the pathology of interest. Projections of the female population disaggregated by age, federal state and insurance scheme for the years 1998-2011 and 2010-2015, conducted by the College of Mexico and the National Population Council (*Consejo Nacional de Población*, Conapo), were also used.¹⁸ The marginalization index estimated by the Conapo¹⁹ was included in the analysis to include the heterogeneity of socioeconomic development between federative states. The study was authorized by the ethics and research committees of the National Institute of Public Health (*Instituto Nacional de Salud Pública*, INSP) record number 774.

Information analysis

Information tables about women with BC aged 25 years or older were built per year, federal state and insurance scheme with data from the databases, drawing from discharge and mortality information. Discharges and deaths with unspecified age (0.006 and 0.057%, respectively) were excluded. Specific mortality rates among age groups of women aged 25 years and older were calculated at the national and federative state levels. For comparison purposes, it was standardized for age* within each group. Subsequently, the rates were adjusted by the direct method to eliminate the effects of any age difference between the insurance scheme, the federative states and the analyzed years.²⁰ The standard population corresponded to the combined populations

* The age-standardized rates do not reflect the actual mortality risk in a population because the numerical value of age-adjusted mortality depends on the standard population used.

of women aged 25 or older per analyzed year, nationally and by federative state. The annual percentage change was used to assess trends, and statistical significance was estimated using joinpoint* models.

Results

Hospital discharges for breast cancer

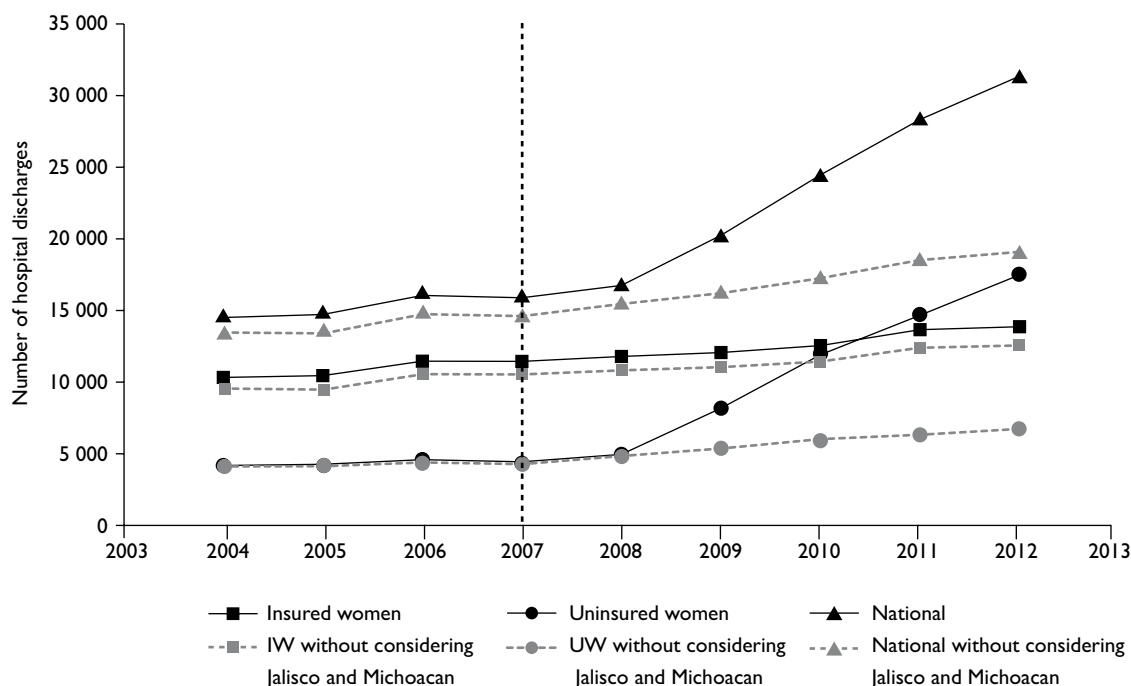
Nationally, joinpoint analysis allowed the two increase periods for uninsured women (UW), 2003-2007 and 2007-2012, to be distinguished, with mean annual increases of 0.9% ($p=0.9$) and 34.2% ($p<0.05$), respectively.

* Joinpoint Regression Program version 4.2.0.1. Statistical Methodology and Applications Branch, Surveillance Research Program. National Cancer Institute, 2015.

For insured women (IW), these percentages were 3.3% ($p<0.05$) and 4.2% ($p<0.05$), respectively (figure 1). The numbers of hospital discharges by federative state are shown in table I. During 2004-2009, the Federal District, Veracruz and Jalisco were highlighted as the states that concentrated the largest numbers of hospital discharges for BC. However, the increase was remarkable since 2009 for Jalisco and 2010 for Michoacan. As a result, from 2007 to 2012, the percentages of the mean annual increase of hospital discharge numbers nationwide and among UW were 14.8% ($p<0.05$) and 34.2% ($p<0.05$), respectively. By excluding the states of Michoacan and Jalisco, this trend continued, but at lower rates: 5.4% ($p<0.05$) and 9.8% ($p<0.05$), respectively.

Breast cancer mortality

The number of breast cancer deaths at the national level also showed an upward trend during the periods



IW: Insured women (affiliated to the health services of the Mexican Social Security Institute, Institute for Social Security and Services for State Workers, Pemex, Navy Ministry or National Defense Ministry)

UW: Uninsured women (without any insurance scheme and affiliated with the System of Social Protection in Health)

Source: own calculations from the sectoral databases of hospital discharges, 2004-2012, General Direction of Health Information/Health Secretariat.

FIGURE 1. HOSPITAL DISCHARGES IN WOMEN WITH BREAST CANCER AGED 25 YEARS OR OLDER, ACCORDING TO INSURANCE SCHEME. MEXICO, 2004-2012

Table I
HOSPITAL DISCHARGES IN WOMEN WITH BREAST CANCER AGED 25 YEARS OR OLDER, ACCORDING TO INSURANCE SCHEME AND FEDERATIVE STATE. MEXICO, 2004-2012

Federative state	2004		2005		2006		2007		2008		2009		2010		2011		2012	
	IW	UW	IW	UW	IW	UW	IW	UW	IW	UW	IW	UW	IW	UW	IW	UW	IW	UW
Aguascalientes	113	319	70	283	179	159	96	196	76	214	91	424	85	733	105	514	74	344
Baja California	284	42	256	62	344	56	355	117	423	61	392	85	398	83	469	125	545	237
Baja California Sur	48	21	61	23	80	15	103	25	71	36	102	22	104	24	103	32	108	31
Campeche	20	9	25	6	33	25	29	21	35	11	37	4	42	15	29	32	22	58
Coahuila	354	70	314	98	401	70	447	66	418	77	382	110	406	134	470	106	538	135
Colima	51	12	64	19	74	27	66	39	42	47	53	41	71	58	63	69	85	71
Chiapas	88	40	78	46	61	39	66	48	75	40	100	39	83	53	67	60	92	67
Chihuahua	397	84	416	94	339	148	388	101	439	135	498	156	457	193	562	268	613	313
Federal District	3 158	2 372	3 014	2 035	3 241	2 142	3 373	1 876	3 438	2 090	3 504	2 138	3 561	2 382	3 895	2 382	3 745	2 246
Durango	54	50	59	80	106	100	115	70	152	106	119	109	134	96	146	87	148	170
Guanajuato	291	93	288	89	294	91	294	123	359	183	352	240	365	278	420	312	433	327
Guerrero	68	5	102	8	77	9	65	10	75	6	125	7	115	14	114	10	126	14
Hidalgo	73	17	89	18	63	20	32	24	44	22	52	14	43	12	55	16	45	13
Jalisco	848	86	989	122	934	114	898	202	967	202	1 036	2 797	1 109	4 097	1 191	3 990	1 176	4 596
Mexico	195	1	203	9	289	28	219	41	287	42	223	26	297	18	290	20	330	25
Michoacán	98	172	159	203	138	271	179	150	167	100	147	202	170	1 975	232	4 532	289	6 336
Morelos	101	12	115	7	113	10	129	9	110	24	103	43	159	46	165	53	171	49
Nayarit	79	26	68	35	81	49	53	55	75	77	74	96	77	59	59	61	104	115
Nuevo Leon	906	20	1 040	41	979	62	992	41	1 056	61	996	59	1 050	76	1 242	73	1 125	62
Oaxaca	89	47	79	44	93	84	117	103	108	164	102	181	128	160	153	165	140	187
Puebla	411	16	398	71	486	81	586	123	571	114	573	133	555	130	553	148	591	194
Queretaro	143	61	96	49	133	60	195	68	125	55	147	76	152	96	145	107	121	114
Quintana Roo	23	2	18	9	18	9	23	7	34	8	73	8	65	13	126	21	84	56
San Luis Potosi	105	72	125	87	119	90	127	103	108	130	126	125	145	104	173	167	151	178
Sinaloa	312	67	412	104	353	90	425	78	541	119	416	140	420	130	459	136	469	143
Sonora	211	93	226	69	243	101	251	118	251	126	303	135	266	164	261	171	345	168
Tabasco	100	79	79	135	93	115	74	89	93	93	90	149	72	90	128	286	99	338
Tamaulipas	558	99	501	144	653	151	652	178	532	166	644	194	776	192	866	172	989	197
Tlaxcala	6	6	7	10	2	4	10	6	8	12	13	6	13	7	10	2	28	6
Veracruz	839	145	779	221	1 133	311	736	298	773	355	831	333	928	376	823	377	755	510
Yucatan	221	17	224	19	231	25	253	28	254	58	262	71	218	72	202	84	218	104
Zacatecas	85	25	101	27	80	34	101	27	85	25	100	19	89	32	86	89	109	82
National	10 329	4 182	10 455	4 267	11 463	4 590	11 449	4 440	11 792	4 959	12 066	8 182	12 553	11 912	13 662	14 667	13 868	17 486

IW: Insured women (Mexican Social Security Institute, Institute for Social Security and Services for State Workers, Pemex, Navy Ministry or National Defense Ministry)

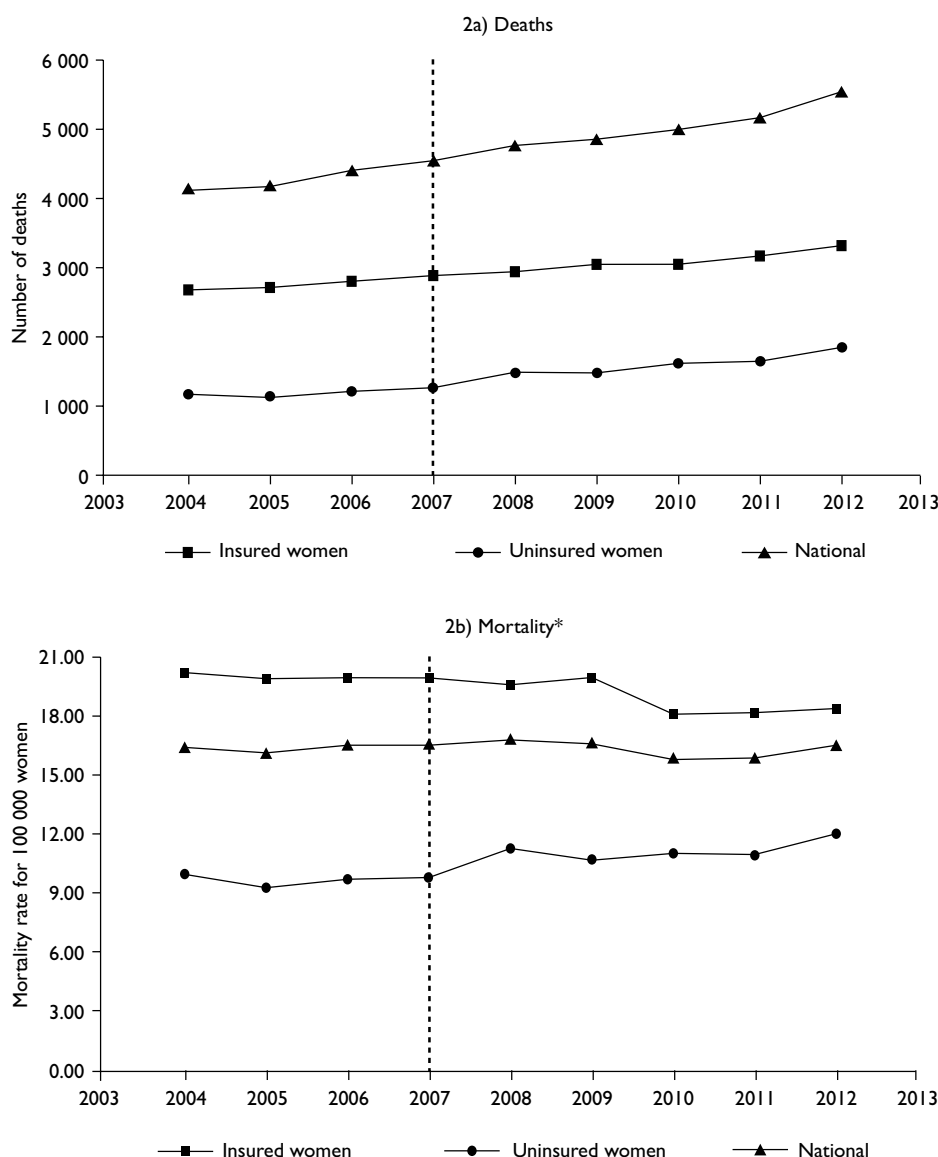
UW: Uninsured women (without any insurance scheme and affiliated with the System of Social Protection in Health)

Source: own calculations from the sectoral databases of hospital discharges, 2004-2012, General Direction of Health Information/Health Secretariat.

2004-2007 and 2007-2012 (figure 2a), with annual rates of 3.4% ($p<0.05$) and 3.9% ($p<0.05$). The analysis of mortality among women with and without social security showed that mortality was higher in IW; however, the annual growth rate during 2004-2007 was higher (4.2%, $p=0.3$) in the UW group than in the IW group (2.4%, $p<0.05$). After 2007, deaths reached a higher rate in the

UW group, with an annual growth rate of 7.1% ($p<0.05$), while the death rate was 2.9% ($p<0.05$) in the IW group.

The mortality rates standardized by age in 25-year-old women or older show that mortality remained constant over the 2004-2012 period nationally (figure 2b). However, when analyzed by insurance scheme, the mortality rates of the IW group were above the



IW: Insured women (affiliated to the health services of the Mexican Social Security Institute, Institute for Social Security and Services for State Workers, Pemex, Navy Ministry or National Defense Ministry)

UW: Uninsured women (without any insurance scheme and affiliated with the System of Social Protection in Health)

*Age-standardized rates

Source: own calculations from the mortality databases, 2004-2012, General Direction of Health Information/Health Secretariat. Insured population projections for 1998-2011 and 2010-2015, National Population Council / General Directorate of Health Information.

FIGURE 2. DEATHS AND MORTALITY* BY BREAST CANCER IN WOMEN AGED 25 YEARS OR OLDER, BY INSURANCE SCHEME. MEXICO, 2004-2012

national rates, opposite to the situation seen with the rates in UW. For IW, joinpoint analysis allowed the observation that the annual mortality rate remained constant for the 2004-2007 period; however, an annual percentage change of -1.9% ($p=0.1$) was observed for

the 2007-2012 period. In contrast, in UW, although the annual mortality rate was also constant from 2004 to 2007, for the second period, a percentage of annual growth of 3.3% ($p<0.05$) was observed. The adjusted mortality rates by federative state were higher in the IW

group than in UW; this finding agrees with nationwide results (table II).

In general, the distribution of mortality rates by federative state indicates that BC remained constant until prior to 2007. From that year, the trends varied considerably, especially in those states with the highest marginalization rate (figure 3a). This finding is consistent with what is shown in figure 3b, which suggests a decreasing trend in BC mortality in women

aged 25 years or older as the marginalization rate increases (2012).

Discussion

Nationally, a growing trend of hospital discharges was observed, particularly in UW, whereas mortality rates standardized by age in 25-year-old or older women remained constant. However, these rates decreased in

Table II
BREAST CANCER* MORTALITY IN WOMEN AGED 25 YEARS OR OLDER, AGE-STANDARDIZED,
BY INSURANCE SCHEME AND FEDERATIVE STATE. MEXICO, 2004-2012

Federative state	2004			2005			2006			2007			2008		
	IW	UW	Total	IW	UW	Total	IW	UW	Total	IW	UW	Total	IW	UW	Total
Aguascalientes	20.58	6.41	16.86	20.54	16.85	19.61	11.78	15.70	13.87	19.92	6.93	17.82	24.42	18.75	24.02
Baja California	17.79	14.53	18.73	20.65	6.89	18.76	16.57	9.83	18.24	20.62	10.58	20.04	19.23	12.12	19.75
Baja California Sur	23.36	8.68	19.49	22.27	14.91	20.31	27.72	5.83	25.30	29.57	14.16	25.42	21.22	27.72	24.26
Campeche	11.41	11.16	11.32	15.61	5.94	12.25	20.98	6.75	15.95	8.22	2.30	6.70	12.55	4.59	9.35
Coahuila	21.58	6.09	19.29	19.04	8.89	18.16	20.23	7.24	19.19	25.78	8.35	24.11	22.96	4.11	19.81
Colima	15.35	16.24	17.75	20.23	10.25	18.00	23.92	15.51	21.37	26.24	15.31	23.83	14.86	14.71	16.80
Chiapas	19.09	3.60	8.07	16.61	3.18	8.34	17.01	3.32	9.08	14.64	1.07	8.13	15.33	7.69	10.91
Chihuahua	22.44	10.85	21.99	20.39	9.64	21.87	26.00	6.41	23.26	22.66	12.29	22.30	27.38	12.35	25.48
Federal District	22.96	20.21	22.57	24.72	20.99	23.87	22.99	20.20	22.76	23.61	19.22	22.58	23.51	21.03	23.27
Durango	20.48	2.05	13.48	17.12	8.40	15.24	17.78	8.69	16.96	22.49	8.86	18.29	20.56	8.88	16.31
Guanajuato	19.37	14.25	17.69	14.14	10.86	13.21	17.14	11.83	15.69	15.79	13.03	15.75	15.99	10.58	14.68
Guerrero	22.65	5.31	11.25	19.53	5.29	10.45	17.19	7.71	11.26	15.57	6.45	11.02	18.56	6.28	11.04
Hidalgo	18.73	7.30	12.35	19.91	8.83	13.75	22.08	7.12	12.86	12.92	9.04	11.09	15.05	7.77	11.52
Jalisco	22.32	16.59	21.03	24.93	15.65	23.01	24.51	18.87	24.18	19.39	14.36	19.08	19.71	17.37	20.75
Mexico	18.58	11.68	16.02	16.78	10.77	14.81	17.07	10.03	14.31	17.73	9.83	14.47	17.56	11.76	15.31
Michoacan	16.18	9.55	13.15	19.04	7.23	12.76	22.10	9.96	16.13	18.30	12.51	15.41	19.24	12.89	16.38
Morelos	21.39	9.85	16.95	22.01	6.79	14.97	18.28	10.60	15.41	21.91	13.43	18.15	20.49	11.10	16.53
Nayarit	20.19	10.18	17.08	20.33	11.12	17.24	22.61	7.76	16.24	15.64	13.17	15.54	16.56	11.71	15.55
Nuevo Leon	20.86	11.92	20.13	24.49	6.98	21.93	21.54	13.62	21.04	22.93	15.04	22.43	24.70	14.89	24.21
Oaxaca	15.00	7.37	9.98	13.18	6.54	9.09	13.10	2.75	10.51	12.46	1.93	10.37	12.00	9.88	11.07
Puebla	18.34	5.07	11.00	16.01	6.13	10.28	18.75	6.24	11.40	26.18	6.38	14.40	18.88	6.72	12.49
Queretaro	21.44	9.41	17.12	20.20	9.35	16.80	22.52	12.05	18.48	16.29	9.68	14.15	12.97	13.20	12.82
Quintana Roo	4.87	4.55	4.65	5.06	1.03	3.94	11.42	1.80	8.05	11.91	5.46	9.73	4.24	8.31	7.82
San Luis Potosi	16.61	5.97	11.46	17.83	6.10	12.02	21.46	8.42	15.46	19.42	12.32	16.20	22.02	11.74	17.01
Sinaloa	20.59	8.58	18.75	20.37	11.38	19.79	22.28	9.37	19.06	20.35	8.00	16.70	18.00	9.97	16.29
Sonora	24.05	17.63	23.44	21.16	18.21	21.65	20.72	10.61	19.43	22.29	14.05	21.14	26.77	19.16	25.76
Tabasco	18.28	7.80	12.61	16.37	9.43	12.60	15.06	4.61	9.77	9.57	6.21	9.52	12.13	12.37	12.89
Tamaulipas	24.40	14.01	21.12	25.13	8.97	20.88	22.55	14.66	21.02	24.35	11.84	20.46	19.79	10.36	16.82
Tlaxcala	20.27	5.15	11.50	9.14	8.78	9.52	9.80	11.09	10.75	17.58	11.57	14.30	15.60	8.54	12.39
Veracruz	19.77	8.03	14.67	19.53	7.35	13.85	19.50	8.81	14.61	19.06	9.31	14.85	18.17	9.33	14.08
Yucatan	19.43	4.92	15.00	11.41	4.76	9.57	11.27	6.92	10.11	12.26	3.84	9.39	9.74	3.27	7.29
Zacatecas	15.17	11.25	13.46	19.61	8.48	14.43	13.10	7.92	11.18	16.23	13.88	17.34	16.52	15.25	16.70
National	19.80	10.90	16.43	19.27	10.20	16.15	19.47	10.64	16.53	19.28	10.74	16.54	18.89	12.12	16.80

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Federative state	2009			2010			2011			2012		
	IW	UW	Total	IW	UW	Total	IW	UW	Total	IW	UW	Total
Aguascalientes	17.95	10.31	16.74	14.06	10.27	14.12	18.91	14.96	17.89	21.09	16.06	20.46
Baja California	20.80	12.00	19.87	18.84	12.24	18.88	17.14	13.05	18.47	18.13	14.19	19.15
Baja California Sur	23.97	18.85	22.47	24.00	6.18	18.34	24.65	12.09	21.74	20.49	16.35	19.03
Campeche	13.29	8.56	12.33	11.49	9.95	11.41	9.09	6.78	9.34	7.85	7.70	8.56
Coahuila	22.80	9.14	21.39	20.43	9.16	20.29	23.17	12.30	22.14	23.78	10.63	22.68
Colima	17.24	21.90	19.20	21.37	17.00	20.52	18.83	22.18	21.49	20.86	25.18	22.34
Chiapas	19.00	6.31	10.57	14.94	7.89	10.82	16.64	7.54	11.46	13.22	9.43	11.82
Chihuahua	23.36	14.86	23.01	18.86	15.20	19.29	24.52	11.77	23.36	22.04	10.43	20.06
Federal District	24.20	19.32	22.88	22.81	21.26	22.33	22.07	20.19	22.39	20.96	21.58	21.49
Durango	14.49	8.03	13.00	12.95	11.78	13.76	17.13	9.21	14.26	18.09	14.38	17.79
Guanajuato	15.73	12.17	14.59	13.28	10.86	12.84	17.98	11.74	15.66	17.07	13.96	16.09
Guerrero	17.98	7.45	11.85	22.41	5.89	12.34	15.74	5.93	10.41	17.25	6.21	11.05
Hidalgo	20.18	9.09	13.62	12.67	7.66	10.21	16.79	9.54	12.92	19.08	9.00	13.44
Jalisco	20.60	14.62	19.70	20.74	15.47	19.90	21.43	18.97	21.69	21.66	16.74	21.59
Mexico	16.78	9.95	14.06	15.41	11.64	13.99	15.06	10.71	13.56	14.73	11.69	13.81
Michoacan	24.21	14.97	19.28	17.38	13.62	15.91	17.85	10.69	14.75	17.87	14.22	16.49
Morelos	17.03	8.69	13.11	17.78	12.37	16.44	20.58	9.40	16.75	24.80	11.89	19.07
Nayarit	14.18	15.40	17.69	14.78	9.13	13.74	10.74	17.30	14.31	16.15	12.96	15.70
Nuevo Leon	22.24	15.33	22.32	22.07	13.06	22.17	20.92	11.38	19.62	22.40	10.51	20.78
Oaxaca	7.28	5.84	7.71	8.63	7.24	8.40	8.92	6.61	8.20	10.88	5.66	8.16
Puebla	21.57	7.34	12.98	16.71	6.36	11.04	16.78	6.71	11.16	17.50	7.24	12.49
Queretaro	22.70	12.59	18.67	19.14	9.90	15.66	14.58	11.10	13.70	16.28	14.94	16.31
Quintana Roo	6.88	4.79	6.73	8.98	1.51	7.00	7.85	4.37	6.83	10.08	6.14	9.14
San Luis Potosi	21.88	8.51	15.80	19.22	10.74	15.94	18.81	11.67	15.79	13.53	12.72	14.54
Sinaloa	23.01	13.24	20.51	20.83	8.21	17.40	16.36	7.72	14.82	19.44	17.07	19.79
Sonora	16.50	21.66	19.76	22.12	20.60	22.05	19.12	17.50	19.24	19.64	23.95	21.84
Tabasco	13.96	10.31	12.22	14.92	11.93	13.45	10.11	10.02	11.18	12.44	11.05	12.08
Tamaulipas	21.90	11.77	19.54	20.37	13.51	18.96	21.47	10.94	18.23	20.63	10.00	17.69
Tlaxcala	20.54	7.40	13.26	12.85	9.37	10.56	11.43	6.69	9.88	14.36	8.87	12.24
Veracruz	24.25	8.76	15.48	15.75	10.24	14.36	16.30	11.68	14.45	18.98	11.41	16.31
Yucatan	14.58	7.37	12.02	12.92	5.60	10.64	14.37	6.52	12.96	10.35	12.49	12.07
Zacatecas	19.45	7.41	13.92	19.18	9.61	15.30	17.01	7.68	12.76	19.62	13.51	17.67
National	19.67	11.67	16.60	17.55	11.94	15.85	17.62	11.83	15.93	17.90	12.94	16.57

* Mortality rate per 100 000 women aged 25 years or older

IW: Insured women (affiliated to the health services of the Mexican Social Security Institute, Institute for Social Security and Services for State Workers, Pemex, Navy Ministry or National Defense Ministry)

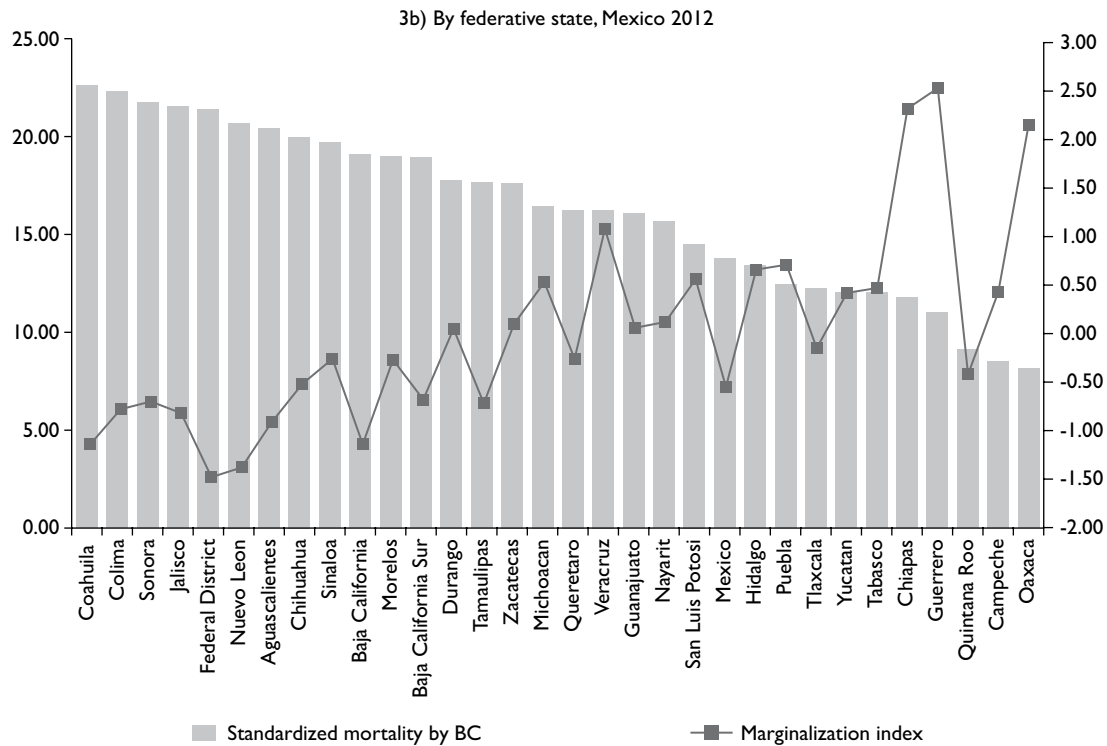
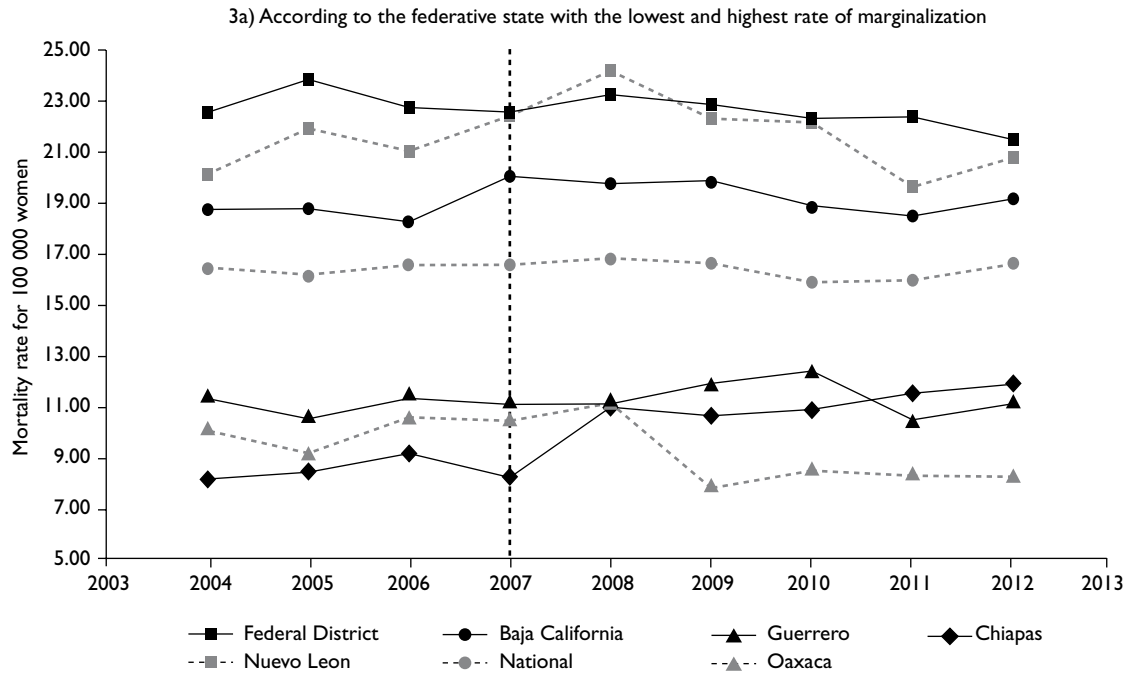
UW: Uninsured women (without any insurance scheme and affiliated with the System of Social Protection in Health)

Source: Own calculations from mortality databases, 2004-2012, General Direction of Health Information/Health Secretariat. Insured population projections for 1998-2011 and 2010-2015, National Population Council / General Directorate of Health Information.

IW from 2009, while in UW, rates increased from 2007. In addition, mortality rates were higher in federative states with low marginalization levels than in states with high marginalization levels.

The results of this study show an increase in the number of hospital discharges for BC from the inclusion of the comprehensive BC treatment into the FPGC.

This result is consistent with the findings of an initial assessment of the SPSS impact conducted by Gakidou and colleagues.²¹ They reported that municipalities with high levels of SPSS affiliation had higher rates of hospitalization, and the impact was greater when it accounted for conditions included in the FPGC. However, higher increases in the states of Michoacan and Jalisco were



*Aged-standardized rate

Source: own calculations from mortality databases 2012, General Direction of Health Information/Health Secretariat. Insured population projections 2010-2015, Marginalization index data. National Population Council/General Directorate of Health Information, 2010

FIGURE 3. BREAST CANCER* AND MARGINALIZATION INDEX IN WOMEN AGED 25 YEARS OR OLDER, BY FEDERATIVE STATE. MEXICO, 2004-2012

noted, which could result from a difference from the other states in terms of the hospitalization criteria. Similarly, other studies have shown an increase in the use of public hospital services associated with an increased SPSS affiliation,^{22,23} which is more pronounced when the condition is included in the FPGC.²⁴ This finding is consistent with studies stating that when removing financial barriers to access the health services, there is an increased utilization of hospital health services, particularly in populations that did not use these services previously.^{25,26}

The number of deaths and the mortality rates experienced growing trends nationwide, which contrasts with expected results given the greater availability and access to health services.^{27,28} Studies in other countries have suggested, after a reform in the health system, that the health coverage improvement increases the use of services and decreases mortality.²⁹⁻³¹ However, this reduction is hampered by inequalities in education^{30,32} and socioeconomic levels.^{29,32} Thus, in Mexico, Bautista-Arredondo *et al.*³² found that people with lower education levels and who are poorer are less likely to access outpatient medical services, even if the service is a beneficiary of SPSS. This finding suggests that the coverage of social health protection is a necessary but insufficient condition to reduce inequalities in access to primary outpatient care. This factor may be one reason why such a result in this study was not found, as most members of the SPSS are located in groups with social inequalities. Another possible explanation is that breast cancer in women is detected at an advanced clinical stage; thus, improvements should be incorporated in terms of access, screening by mammography, and the timeliness of diagnosis and treatment. Another explanation could correspond to the fact that FPGC covers only the costs of the disease; however, the infrastructure, equipment and the number of available spots may not be sufficient to provide the treatment with the required timeliness and quality.³³ Subsequent studies could deepen these hypotheses, with the additional advantage that the period of inclusion of breast cancer in the FPGC would be higher.

In Mexico, there is a legal and regulatory framework for universal access to BC treatment; however, this framework needs to be translated into effective and timely access to a health services infrastructure and sufficient human resources to meet the demand of such services.¹⁴ However, increasing the available information about the benefits of using FPGC through awareness campaigns about the existing regulations to both health care providers and women would be advisable.

The nationwide breast cancer mortality rates in women aged 25 years or older presented here are similar

to those reported in other studies.^{3,34,35} However, this study is one of the first that takes into account the insurance scheme, which gives an added value to generate an hypotheses about the differential impact of the inclusion of comprehensive BC treatment between FPGC populations with and without social security.

One limitation of this study is that it does not measure BC prevalence and incidence because the number of hospital discharges is different from the number of patients. Moreover, for some years (2005 and 2011), no reliable data at the national and federative state levels were available on the number of hospital discharges for BC per age group. To resolve this issue, some populations for which the number of hospital discharges for BC was not available were estimated; therefore, the results may not reflect actual trends for these years. This estimation is a limitation of this study because of the lack of population information disaggregated by age groups and the lack of access to original source data (i.e., medical records). Another limitation of the study is not upholding the correlations between mortality rates and some determinants of health inequalities because they were not part of the objectives of this study. However, this analysis attempts to establish the foundations to perform other studies in greater depth that could identify the factors that limit the effects of including comprehensive BC treatment in the FPGC.

In conclusion, the results of this study suggest that trends in mortality rates among women are heterogeneous according to insurance scheme and are higher for UW than for IW, who showed a decreasing trend. These findings could be a reflection of differences in socioeconomic status or could be because the coverage of mammography screening is higher among IW than among UW.⁷ This difference results in BC treatment beginning at an earlier stage for IW than for UW. Although the current FPGC operation has not yet shown the desired change in the health indicator, improvements in access, strengthening the mechanisms to recruit women to the SPSS, and ensuring the implementation of regulations and consolidating systems for training, evaluation, monitoring and compliance of operating regulations and treatment guides for BC systems is necessary. The adaptation of the established capacity to the demand for services is necessary, as is the development of a leadership capacity of health authorities to fulfill the roles of coordination and regulation. These changes would improve equity in access to BC treatment care and would inform on population-wide results.

Declaration of conflict of interests. The authors declare that they have no conflict of interests.

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